



Elemental composition of solid aerosols of different size fraction as exemplified by the Baikal region

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It is preferable to analyse fine aerosol fractions (less than 1 micron) to study remote and regional transfers. In our survey, we used a size fraction of 0.39-0.69 micron which can exist in atmosphere air for several days transferred at distance of hundreds of meters from the source of their origin. A six-phase high volume slit cascade impactor TE-236 (Tisch Environmental Inc.) was used for sampling. Among 20 elements analysed by XRFA-SR, the most informative elements (Ti, Mn, Ni, Cu, Zn, Ga, Ge, Sr, Br, and Pb) were chosen having the highest differences among the sources.

These sources with chosen elements were divided into two groups: the first was a group of anthropogenic sources of one type and the second was a group of sources differing from the first one. Concentrations of all elements excluding copper were much higher in the first group than in the second. The curve shape (ratio of elements) for both groups was also significantly different. Differences of elemental ratio in emissions of anthropogenic sources may serve as an indicator of remote effect of these sources on the background territories, in this case, on the southern basin of Lake Baikal. To analyse relative contribution of the sources to the atmosphere pollution of any region, the ratio between concentrations of chosen elements and Cu concentration was used instead of absolute concentrations.

Qualitative relative contribution of the sources to aerosols of Southern Baikal (as exemplified by Listvyanka) can be estimated using multiple linear regression analysis. This analysis was used to estimate the effect of two groups of anthropogenic sources on aerosol composition in the settlement Listvyanka. The composition of fine-disperse aerosol fractions was analysed in two samples collected in Listvyanka in 2009. These two samples were obtained during transfer of air masses from Irkutsk. The first sample (20-21 October 2009) was collected at weak north-western (NW) wind and another sample (27-28 October 2009) – at strong NW wind.

These results show that at weak north-western transfer the elemental composition of fine-disperse fraction of aerosols in Listvyanka corresponds to the first group of aerosol sources (80-90%), whereas the percentage of more remote sources makes up about 2-3%.